

# NASA TECH BRIEF

## *Marshall Space Flight Center*



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### Isogrid Structure

The isogrid structure is a practical design of isogrid shells. It is essentially an isotropic rib-stiffened shell whose ribs intersect to form equilateral triangles. Though isogrid structures are of particular interest to the aerospace industry, methods used in their analysis can be applied to numerous structural design problems. In this case, the analysis develops the principal bending stress relations and discusses buckling, thermal loading, and optimization of cylinders and spheres for the axisymmetric uniform-loading case. In addition, it includes a number of examples and experimental results.

The advantages of the structure for stiffened non-rectangular plates and plates supported or loaded locally are the high twisting rigidity of the construction, which acts to distribute the loading over a wide region, and the simplicity of the triangular pattern, which can accommodate non-rectangular boundaries. From the constructional point of view, a weight advantage may be obtained by drilling holes at the centers of the grid points where fillet material tends to build up. These holes could serve as natural attachment points for stud inserts to secure material and transfer local loads to the plate.

The analysis of the isogrid structure presents the results of an experiment used to determine the effect of the amount of reinforcement at the rib nodes on the overall bending stiffness. The specimen used was machined from a polycarbonate plastic plate, the elastic modulus being determined from tensile specimens taken from the same sheet of material. Brake forming methods

were also evaluated in a series of three point bending tests, the primary object being the determination of the effect of spacing the support points used in the three point forming.

An experimental program, using the three-dimensional photoelastic, stress freezing technique, is presently being performed to obtain detailed information on the stress distribution in isogrid stiffened shells.

#### Notes:

1. Information concerning this innovation may be of interest to industry due to its applicability in structural design and analysis, particularly in the area of pressure vessels.
2. Requests for further information may be directed to:  
Technology Utilization Officer  
Marshall Space Flight Center  
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#### Patent status:

No patent action is contemplated by NASA.

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